

## Why Use Contracts? The Economics of Contracts

---

Why would farmers and their buyers shift to contracts from spot markets? Agricultural product prices traditionally were—and for many products still are—determined in open spot markets, either in direct negotiation between individual buyers and sellers or in public auctions (including, these days, satellite and Internet auctions), based on attributes observable in the live animal or harvested product. Transaction terms such as prices, locations, some product attributes, and times of sale and delivery are accessible and easy to record, and information based on them can be easily disseminated to all market participants.

Accurate and widely available market information coordinates supply chains that are based on spot markets. Accurately reported information should cause prices in similar transactions to converge to a common “market price” as buyers avoid paying exceptionally high prices and sellers do not accept exceptionally low ones. Then reliable market price information will provide important signals such as cost and value differences, regional price differences, and quantities available to buyers and sellers. Prices should be flexible, in the sense that they respond quickly and accurately to underlying changes in market conditions, and reported price information should quickly reflect actual price changes.

Effective vertical coordination through spot markets achieves several goals. For consumers, accurate market prices signal the degree of product scarcity, inducing greater consumption of products in oversupply and limiting consumption of scarce products. Accurate prices will also stimulate production of product attributes that consumers prefer. For sellers, accurate market prices provide signals of buyer preferences and will elicit flows of inputs and services. Combined with competition among providers, accurate market prices will give strong profit incentives to firms to find ways to reduce costs and improve productivity through innovation.

### How Can Spot Markets Go Wrong?

Traditional spot market pricing systems can become ineffective at providing appropriate signals to producers and consumers. Spot markets will fail to respond to changes in consumer demand if prices do not reflect the attributes of products that consumers prefer. For example, some observers of the beef industry argue that spot market beef pricing systems failed to accurately reflect consumer preferences for taste and tenderness, and hence producers were not rewarded for producing desired products or penalized for producing inferior ones. Since desired products cost more, producers had no price incentives to produce the desired attributes (Purcell, 2002; Ward, 2001). If production is to be driven by product attributes that cannot be accurately priced, a different coordination system is needed, one provided by contracting and vertical integration.

To work well, spot markets also require competition, in the form of many buyers and sellers. An increasing number of agricultural markets are marked by limited competition and relatively few buyers, due to economies of scale in processing (cost advantage to large size), and sometimes because of increased demand for distinctive agricultural products (creating a niche market for the product). Farmers may often be reluctant to commit to investing in land and assets if that investment would leave them dependent on a single buyer.

## Why Shift to Contracts?

Two broad approaches dominate economists' thinking on the choice between spot markets and contracts. One, the *risk-sharing* approach, sees contracts as a device used to limit the economic risks faced by farmers. Farmers may face input and output price fluctuations in spot markets, along with the risk of poor production. Such risks may raise farm costs and inhibit production. In contrast, the *transactions* cost approach emphasizes the costs of using spot markets to arrange transactions and sees contracts as a device that can reduce those costs. Parties will rely on contracts when the transactions costs of using contracts fall below the costs of using spot markets. The two approaches are not mutually exclusive, although economic analyses frequently emphasize one or the other.

## Contracts Share Risk and Provide Incentives

Income from farming is risky because it depends on prices and output that may fluctuate widely and are difficult to forecast with accuracy. Risks matter for several reasons. First, some farmers may dislike income fluctuations. Second, risk can impose costs: when income is variable and uncertain, farmers may find it difficult to meet recurring financial obligations or to plan production and investment decisions. When farmers as a group try to avert risks by modifying production practices—changing their use of inputs such as pesticides or fertilizer, or altering cropping patterns—they affect prices, incomes, and input usage patterns.<sup>1</sup>

Our analyses focus on two sources of income risk: *yield (or production)* risk and *price* risk. *Yield risks* for crops result from unpredictable events such as drought, frost, hail, and insect infestations, while livestock production risks can arise from disease, feed supply shortages, extreme temperatures, or machinery malfunctions. Yield risks can be common, affecting a large region or group of producers, or *idiosyncratic*, affecting only one or a few farmers.

*Price risks* arise from unanticipated changes in output or input prices. Agricultural prices often fluctuate widely because of unexpected changes in production or demand in market environments in which supply and demand are insensitive to price movements. Such market insensitivity is frequent in agriculture because agricultural commodity costs form small shares of processed food costs and because farmers have limited ability to adjust to changes in price after they have planted their crops or sunk resources into production.

<sup>1</sup> See Chavas and Holt, 1990; Leathers and Quiggin, 1991; Loehman and Nelson, 1992; Pope and Kramer, 1979; Roberts and Key, 2002.

Farmers who are averse to risks may be willing to pay a price or forego some income in order to reduce their risks. The amount of income they would be willing to give up would measure the degree of their aversion to risk. Risk-sharing explanations for contracts begin with three propositions: (1) farmers are exposed to significant risks; (2) many are risk-averse and are willing to pay, explicitly or implicitly, to reduce risks; and (3) farmers' exposure to risks can often be reduced, thereby creating a market for risk reduction.

Contracts are one technique by which processors can share risk with farmers by shifting risk to the party better able to bear it—in this case, from the farmer to the buyer of the agricultural commodity. Buyers are not necessarily more risk-averse than farmers, but they are frequently less exposed; they may get products from many different regions, and diversifying their supply may reduce their overall risks. Buyers may also produce a variety of products sold in many markets, and product diversification may also limit their exposure to risks. When buyers are large public corporations, their stockholders usually have highly diversified portfolios and are not significantly affected by the actions of the large corporate buyer. In contrast, farmers are usually able to obtain only limited diversification of the farm's business. With most of their wealth tied to the farm, they face greater risk than many buyers and have reason to be more cautious.

Contracts designed solely to limit farmers' risk exposure can remove farmer incentives to undertake good management practices, and can therefore lead to higher total costs. For example, a hog contract may specify that the processor pay the farmer a fixed fee for each hog delivered. Under such a contract, the processor bears all the price risk, and from a risk-sharing perspective this is ideal since the processor may be better positioned to manage risks. Once the contract is signed, will the farmer use the best practices and carefully raise the hogs, producing the quantity and quality of pork that is best for the processor? Possibly, but since the price is set and no longer depends on the farmer's best effort, he or she may decide to cut corners by using fewer or lower quality inputs when raising the hogs. In order to prevent "shirking" by a farmer, contracts will shift some—but not all—of the risk by making the farmer's payment depend in part on effort, thereby retaining incentives for efficiency.

Contracts can be designed to limit farmers' exposure to risks, but contracts will pay for shifting risks to contractors by providing farmers with lower prices. If risk-sharing were the primary reason to use contracts, we would expect farmers using contracts to generally receive lower prices. However, average contract prices reported in the previous section systematically exceed nationwide average prices for the same crops, which suggests that risk-sharing may not be the primary force driving the use of contracts.

## **Contracts Reduce Transactions Costs in Some Spot Markets**

Several types of transactions costs arise in regard to agricultural contracting, and two perspectives are relevant to this discussion. The first relates to the ideas of *asset specificity* and *holdup* (Williamson, 1975; Hart, 1995). The

second relates to the costs of *measuring and monitoring* market transactions (Allen and Lueck, 2003; Barzel, 1982).

### ***Asset Specificity and Holdup***

According to Williamson (1985), asset specificity refers to durable investments that are undertaken in support of particular transactions. The specificity arises when assets are much less useful, and hence less valuable, in any use other than the one they were designed for; that is, redeployment is quite costly. For example, specialized broiler houses offer optimal growing conditions and are designed to facilitate feed delivery, regulate temperature through ventilation and cooling systems, and incorporate specific feed and water delivery systems. Costly equipment designed for broiler production is much less valuable when redeployed to another use. Moreover, the equipment may be designed to a particular processor's specifications.

The broiler house example captures two elements of asset specificity—physical asset specificity and site specificity. Physical asset specificity arises because the asset is dedicated to a particular use, such as raising broilers, and is far less valuable in uses like equipment storage. By itself, such specificity may not create problems if there are many potential buyers for broilers, because the physical assets could be redeployed to transactions with other broiler buyers. Site specificity arises because chickens cannot be shipped far before losing value, due to both direct costs of transport and extra feed and indirect costs from the birds losing value due to stress-related weight loss or death during transport, or to aging during additional feeding. Therefore, the asset is most valuable when used in production for nearby buyers. In this case, the two forms of asset specificity, site and physical, tie the farmer to only a few potential buyers.

In another example, sugar beet production requires highly specialized harvesting equipment and extensive investment in seed beds, constituting physical asset specificity. While sugar beets can be transported further than live poultry without losing value, transport costs—and site specificity—are still significant. Sugar in beets starts converting to starch quickly after harvest and the investment is most valuable when committed to a nearby processor.

Once a farmer makes a costly investment specific to transactions with one or a few buyers, there is potential for “holdup.” When it is costly to ship agricultural products very far, processing plants will locate in farm regions. If there are also economies of scale in processing (so that larger plants realize lower processing costs), one or a few processing plants will be enough to handle all local production, leaving farmers with just a few buyers.

When the farmer harvests and attempts to sell in a spot market, a processor can attempt to force very low prices on the farmer—the holdup in this case refers to the processor holding up the farmer for a lower price. The sugar beet farmer would have few alternatives because of the costs of distant transport, as would the poultry grower, for whom it is costly to ship the birds very far or to keep them on feed.

However, asset and site specificity also create a risk for the processor in a spot market. In spot markets, farmers may not make the investments in

specific assets that could reduce production expenses and raise quality if those investments leave the farmer dependent on the good will of a single buyer. In that case, spot markets can fail, in that they do not elicit the investments in technology and expertise that will reduce costs and improve product qualities.

Contracts can relieve the failure of spot markets. By using a contract to specify a compensation scheme with the processor before making an investment, the farmer can eliminate the risk of holdup. Indeed, in some cases, processors may directly finance farmer investments through the contract. By offering contracts, the processor can obtain investment commitments from farmers and assure the commodity supply needed to support an expensive investment in processing facilities. Contracts limit the incentives, inherent in these spot markets, to forego substantial long-term gains in favor of fleeting short-term advantages.

The concept of asset specificity also encompasses temporal specificity with regard to perishable commodities in cases where a farmer's production loses substantial value if sold earlier or later. For instance, a grower may produce a commodity for a particular shipper, one that meets specific quality standards or requirements. After harvest, a shipper in a spot market transaction may attempt to pay an extremely low price, knowing that the grower has no immediate alternatives. Unless there is another buyer nearby, ready to buy the specific product, the grower may realize a loss. Without a contract, the grower may therefore choose to produce a less-specialized and more widely marketable commodity instead of the specific and differentiated product. In this case, a contract, by shielding the grower from the chance of holdup, may be necessary to elicit grower commitments to produce the product.

### ***Costs of Search, Measurement, and Monitoring***

Information costs often arise in market transactions; they include the *search cost* of finding a buyer and a seller in the transaction, the *measurement cost* of determining product quality (Allen and Lueck, 2003), and the *monitoring cost* of ensuring that all terms of a transaction are met (including quality and quantity specifications, delivery terms, and payment). For example, some processors and other handlers face the challenge of securing the required quality and variety of products within precise timeframes to regulate the flow of a product into processing plants. A processor of organic tomatoes might aim to can tomatoes within 8 hours of picking, or a fresh produce shipper could seek to provide lettuce and tomatoes of specific qualities throughout the year to meet retailer requirements. In these instances, buyers aim to carefully track and control the timing of product flows through the system.

Transactions also require accurate information to identify product attributes if farmer compensation is to be linked to attributes. For example, processors of vegetables and fruits and manufacturers of cigarettes require commodities with specific qualities and varieties, which vary by processor. Processors can secure the needed qualities and varieties through spot markets if effective measurement technologies and widely understood metrics exist. For example, the key distinctive attributes in high-protein soybeans, high-protein

wheat, and high-starch corn can all be precisely measured with near-infrared measurement technology. But quality measurement may be quite difficult, especially for perishable products and if a processor requires that the product have unusual attributes.

As a result, most fresh-market lettuce and virtually all processed vegetables are grown under contracts specifying a coordinated production process. These contracts typically specify seed stock, fertilizer and chemical inputs, and product qualities; the contractor may even provide these inputs to the farmer. In addition, the contractor might monitor crop development and production processes through field visits. For lettuce sold under contract, the buying firm typically harvests, packs, and markets the crop, and frequently performs post-harvest laboratory tests on the crop to ensure that specific production practices were followed.

Sellers of specialty meat products often use contracts to ensure consistent quality. For example, a small processor of smoked pork and bacon products controls product flows and quality by contracting for pork bellies from hogs raised to its specifications in Canada and the Upper Midwest (Apple, 2000). The contracts specify precise feed rations and slaughter weights to ensure the desired taste attributes, rather than relying on post-slaughter testing.

Contracts may help firms procure specific attributes by precisely setting forth production, harvest, and/or marketing practices, and providing for onsite monitoring and advice. Initial grower recruitment can be done through farm inspections. Processors then obtain attribute certification through contractual control of practices; in contrast, certification in spot markets relies on post-harvest testing and measurement.

Buyers are increasingly interested in identity-preserved products, such as organically produced commodities or specialty grains, with specific attributes that are kept segregated throughout the marketing chain. Identity preservation requires substantial investments in testing, monitoring, and physical separation. Contracts may reduce those costs by controlling production and harvesting practices and by requiring investments in information and measuring at the stages where they are most effective. Again, attribute certification would be met through contractual control and onsite inspection of practices, rather than through information and warranties from the producer.

### ***Costs of Using Contracts***

Contracting provides benefits, but it also carries costs that may often leave spot markets as the best way to organize transactions. That is, market participants may choose among spot markets, contracts, and vertical integration, depending on which is the most effective means of governing any particular set of transactions.

Contracts often limit farmers' control over the farm business with production contracts that prescribe detailed guidelines for inputs and practices imposing the greatest limits. Because many farmers value their autonomy, contractors may have to compensate them for the loss of control implicit in contracting, thereby raising the costs of contract production (Key, 2004).

More generally, contracts are costly to write and to monitor and enforce. It may only make sense for a buyer to use a contract if the buyer is planning to acquire significant volumes of the product—that is, the costs of writing contracts may limit their use among small and dispersed producers (Lambert and Wilson, 2003).

Contracts can introduce a new set of strategic risks for farmers. For example, once a farmer has contracted to produce a crop or livestock variety specific to the needs of a single buyer, the farmer faces risks of failure of the buyer/contractor to purchase the product, with attendant risks to market access and payment. The farmer also faces the risk of harvesting crops or producing animals that fall below contracted quality or quantity requirements—with attendant penalties for noncompliance.

Contracts can be quite complex and are generally written by processors and other first-handlers. They may contain highly complicated incentive schemes that create unknown new risks for producers (Hamilton, 1995). Moreover, farmers may find it difficult to compare prices across contracts, because contract terms may contain language specialized to the farmer or circumstance of production, and—particularly in livestock—terms are not generally publicized. As a result, contract prices may not serve the market clearing and signaling functions that spot market prices serve, particularly if they are not anchored to spot prices.

Spot markets still govern nearly 60 percent of agricultural transactions and remain an efficient way to organize the production and distribution of many products. Moreover, technological change has sometimes led to greater use of spot markets. For example, cattle feeding shifted over time from small farmer feedlots to large commercial feedlots that enabled substantial scale economies in feeding. Some commercial feedlots rely on contracted feed, but they also purchase large quantities of feed through spot markets. Farmer feedlots usually fed corn grown on-farm to cattle—that is, they were vertically integrated—so the shift to commercial feedlots also implied a shift to spot market sales of feed (Reimund et al, 1980).